PATENT CLAIMS

1. Method of treating and processing alkaloid-, oil- and protein-containing lupine seeds for the extraction of products from the lupine seeds by means of targeted fractionation, whereby the comminuted lupine seed is de-oiled by introducing a solvent and the residue is depleted of substances soluble in the acid range, preferably of alkaloids, by adding acids, **characterised** in that the lupine seeds are comminuted and/or shaped to form discoid flakes in such a way that after pre-crushing of the shelled or non-shelled seed containing the plant seeds the comminution of the plant seeds is carried out by means of a cooled flocculating roller, and that the seed is heated by indirect supply of heat, largely with exclusion of water, and that after de-oiling the depletion of the flakes of substances soluble in the acid range, preferably of alkaloids, is performed by aqueous extraction, with a refined product of a reduced alkaloid level and an aqueous extract being obtained.

2. Method according to Claim 1,
characterised in that after pre-crushing of the shelled or non-shelled seed containing the plant seeds, the comminution of the plant seeds is carried out by means of a flocculating roller, with said flocculating roller being cooled.

3. Method according to Claim 1 or 2,
characterised in that the lupine seeds are screened by shape and size prior to comminution and/or shaping and are subsequently shelled.

4. Method according to any of the Claims 1 to 3,
characterised in that the shelling operation is carried out in correspondence with the so-called cold technique wherein the lupine seeds are halved and separated from the shells.

5. Method according to any of the Claims 1 to 4,
characterised in that said flocculating roller is cooled down to a temperature lower than the denaturation temperature of the lupine proteins, preferably lower than 35 °C.

6. Method according to any of the Claims 1 to 5,
characterised in that said discoid flakes present a platelet thickness of less than 1 mm, preferably in the range between 200 and 400 µm.

7. Method according to any of the Claims 1 to 6,
characterised in that the indirect heat supply is carried out by means of a heat pan.

8. Method according to any of the Claims 1 to 7,
characterised in that the indirect heat supply deactivates seed-inherent enzymes, with the proteins retaining their native properties as largely as possible.

9. Method according to any of the Claims 1 to 8,
characterised in that in the de-oiling step ethanol is used as solvent.

10. Method according to any of the Claims 1 to 8,
characterised in that industrial hexane, pentane, hexane, heptane or supercritical CO_2 is used as solvent for de-oiling the discoid flakes.

11. Method according to Claim 9 or 10,
characterised in that the de-oiling process is combined with a mechanical oil separation process with pressing or with a de-oiling process operating on ethanol/water mixtures, with application of centrifuging techniques.

12. Method according to any of the Claims 1 to 11,
characterised in that the de-oiled discoid flakes are de-solventised.

13. Method according to Claim 12,
characterised in that the de-solventising process is carried out under low-water or water-free conditions.

14. Method according to Claim 12 or 13,
characterised in that the de-solventising process is carried out with a superheated solvent that is preferably hexane or industrial hexane.

15. Method according to any of the Claims 1 to 14,
characterised in that the indirect heat supply to the flakes already de-oiled is carried out by means of a heat pan.

16. Method according to any of the Claims 12 to 15,
characterised in that the oil percentage in the de-oiled and de-solventised flakes, relative to the percentage of dry solids, is lower than 2 %, preferably lower than 1 %.

17. Method according to any of the Claims 12 to 16,
characterised in that the de-oiled and de-solventised flakes are passed on to a disembitterment process providing the following two steps of operation:

- in a first step, the flakes are supplied into an aqueous acid medium for isolation of substances soluble in the acid medium for obtaining an aqueous acid extract as well as a refined product insoluble in the acid range,
- in a second step, the refined product insoluble in the acid range is supplied into an aqueous alkaline medium for obtaining aqueous extracts as well as alkaline refined products insoluble in the acid range.

18. Method according to any of the Claims 12 to 16,
characterised in that shells are added to the de-oiled and de-solventised flakes, which are passed on, together with the flakes, to a disembitterment process providing the following two steps of operation:

- in a first step, the flakes with the shells are supplied into an aqueous acid medium for isolation of substances soluble in the acid medium for obtaining an aqueous acid extract as well as a refined product insoluble in the acid range,
- in a second step, the refined product insoluble in the acid range is supplied into an aqueous alkaline medium for obtaining aqueous extracts as well as alkaline refined products insoluble in the acid range.

19. Method according to Claim 18,
characterised in that prior to the addition to the flakes, the shells are ground, preferably to a particle size smaller than 5 mm.

20. Method according to any of the Claims 17 to 19,
characterised in that the aqueous acid medium in the first process step has a temperature lower than room temperature.

21. Method according to any of the Claims 17 to 20,
characterised in that the isolation of the aqueous extract from the refined product insoluble in the acid range is carried out centrifugally by means of a decanter, and that the decanter is cooled and flushed with water or the extract in the zone of the solids accumulator.

22. Method according to Claim 17 or 18,
characterised in that in the second process step the temperature for extraction in the aqueous alkaline medium is higher than the room temperature and preferably ranges between 35 °C and 45 °C.

23. Method according to any of the Claims 17 to 22,
characterised in that the first process step takes place in a multi-stage aqueous acid process,
that in a process step for adjustment of a ratio between the refined product insoluble in the acid range and the aqueous extract of less than 10:1, one part of the aqueous extract from the immediately joining process step is admixed.

24. Method according to Claim 25,
characterised in that for adjustment of a ratio between the refined product insoluble in the acid range and the aqueous extract of more than 10:1, an outward transfer of one part of this aqueous extract is carried out within the scope of the immediately joining process step.

25. Method according to any of the Claims 17 to 24,
characterised in that for obtaining a product from the aqueous acid extract an isolation of fine substances is carried out by means of a separator such that a product is obtained whose concentration of dry solids is at least 10 %, preferably higher than 16 %, whose protein concentration in the dry solids is higher than 70 %, preferably higher than 85 %, and whose alkaloid level is lower than 0.5 %, preferably 0.1 %, in the dry solids.

26. Method according to Claim 25,
characterised in that the isolation of fine substances by means of a separator is carried out within the scope of the first process step, that involves several aqueous acid process steps, and that the isolation of fine substances is carried out after the first process step or a joining process step.

27. Protein preparation according to any of the Claims 17 to 19,
characterised in that the process of aqueous extraction includes a closed circuit providing the following process stages:

- the de-oiled flakes are suspended in water at a pH level of roughly 3.5 to 5.5 for separation of substances soluble in the acid range, preferably of alkaloids,

- for protein extraction, the suspended flakes, the so-called protein extract, are mixed with a lye at a pH level between 7.0 and 8.5,
- the suspension is separated, by means of a decanter, to obtain a refined product and the protein extract,
- an acid medium is supplied to the protein extract again so as to achieve fractioning of whey and protein curds, and
- the whey is supplied again completely to the pre-extracted flakes at a pH level of roughly 3.5 to 5.5.

28. Method according to Claim 27,
characterised in that the protein extraction is carried out in several pH level stages for achieving protein fractioning.

29. Method according to any of the Claims 27 and 28,
characterised in that the refined product has a protein concentration of less than 20 % in the dry solids, and that the roughage percentage is higher than 60 %, preferably 70 %, and that the percentage of soluble carbohydrates is lower than 5 %, preferably lower than 1 %.

30. Method according to Claim 27,
characterised in that the isolation of whey and protein curds containing more than 85 % of proteins in the dry solids, preferably more than 90 % of proteins in the dry solids, is carried out by means of a decanter.

31. Method according to Claim 30,
characterised in that the extracted whey is subjected to subsequent purification by means of a separator, then to a thermal treatment, and finally to a second step of purification in a separator.

32. Method according to Claim 31,
characterised in that the whey purified twice is supplied into the process again, wherein the solids obtained in the first separation are subjected to further processing in the protein leg and with outward transfer of the solids obtained in the second separation.

33. Method according to Claim 27,
characterised in that the refined product is fractioned by particle sizes into at least 2, preferably 3, fractions after or during a drying stage.

34. Method according to Claim 27,
characterised in that after drying the protein curds present a protein dispersibility index (PDI) of 60 to 90 % and a water-absorption capacity of less than 2g/g at a pH level of roughly 7 and a temperature of 20 to 30 °C.

35. Method according to the Claims 27, 28, 30 and 32,
characterised in that the protein curds is confectioned by a hydro-thermal treatment to form a water binding product, with application of a temperature higher than 65 °C, preferably higher than 85 °C, for drying the protein curds and with a water percentage at the beginning of the drying step of less than 85 %, preferably less than 75 %, while the water absorption capacity of the water binding product so obtained is higher than 4.0 g/g, preferably higher than 5 g/g

36. Method according to any of the Claims 1 to 35,
characterised in that mixtures of roughage and the protein isolates obtained are produced, whose protein level ranges between 20 and 70 %, whose roughage concentration ranges between 30 and 80 %, and whose water absorption capacity is higher than 5 g/g, preferably higher than 7 g/g.

37. Method according to any of the Claims 1 to 36,
characterised in that the shells separated prior to the de-oiling step are mixed and dried with the aqueous alkaloid-containing extract that is extracted at pH levels from 3.5 to 5.5.

38. Method according to any of the Claims 1 to 37,
characterised in that other protein- and oil- or starch-containing seeds such as rape, linseed or leguminous plants, specifically soy beans, peanuts, peas and horse beans, are used instead of lupines in this method.